REMARKS

Reconsideration and allowance are respectfully requested in view of the foregoing amendments and the following remarks.

Upon entry of this Amendment, claims 1-19 are pending in the application. Claims 1, 2, 8, 11, 12 and 14 have been amended and claims 16-19 have been added. The specification has also been amended to correct typographical errors.

The title of the invention is objected to as being undescriptive. Accordingly, the title has been amended to overcome this objection. Withdrawal of this objection is respectfully requested.

Claims 1-15 are rejected under 35 U.S.C. §112, second paragraph. Accordingly, the claims have been amended for clarity purposes only in order to overcome this rejection. The Office Action asserts that it is unclear how a first photodetector disposed on a second region is used to detect quanitity of light entering from a side of a first region, and how a second photodetector disposed on a first region is used to detect quantity of light entering from a side of a second region. However, as can be best understood from Figs. 6 and 7, the first and second photodetectors detect the light entering from opposite sides to the regions in which the photodectectors are disposed by influence of the shading member. Withdrawal of this rejection is respectfully requested.

Claims 1, 2 and 6-8 are rejected under 35 U.S.C. §102(b) by Osawa, U.S. Patent No. 5,072,105. This rejection is respectfully traversed.

Claim 1 is directed to a sensor for detecting a quantity of light, including: a housing having a center axis along a direction in which light enters the sensor when an azimuth is zero with respect to the housing, the center axis dividing a surface of the housing into a first region and a second region; a light sensing portion disposed in the housing to sense incident light, including: a first photodetector disposed on the second region of the housing; a second photodetector disposed on the first region of the housing; a central photodetector disposed on both the first region and the second region of the housing across the axis, and desensitized upon output thereof in comparison with those of the first photodetector and the second photodetector, wherein the first, second and central photodetectors are arranged in an identical plane; and a shading member disposed above the sensing portion and having a light transmittance part and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the sensing portion where the light is incident through the light transmittance and a non-incident area in the sensing portion where the light is not incident, wherein; the first photodetector and the central photodetector cooperatively detect a

first quantity of light entering the sensor from a side of the first region with respect to the axis; and the second photodetector and the central photodetector cooperatively detect a second quantity of light entering the sensor from a side of the second region with respect to the axis.

Osawa does not disclose the sensor for detecting a quantity of light as recited in claim 1. To begin with, Osawa discloses first to third solar radiation sensors 29-31 that are disposed on independent planes, respectively. Specifically, the first to third solar radiation sensors 29-31 are disposed on the surfaces of a base structure 42 that is in the shape of a truncated quadrilateral pyramid. The first and second solar radiation sensors 29, 30 are disposed on two oblique sides of the base 42, while the third solar radiation sensor 31 is disposed on a top end wall of the base 42. Osawa does not disclose first, second and central photodetectors that are arranged in an identical plane, as recited in claim 1.

Moreover, Osawa does not disclose a shading member disposed above the sensing portion and having a light transmittance part and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the sensing portion where the light is incident through the light transmittance, and a non-incident area in the sensing portion where the light is not incident, as recited in claim 1. The Office Action asserts that the windshield in Osawa acts as a shading member having a light transmittance part. However, the windshield does nothing to regulate the light incident in the sensors.

Further, Osawa does not address or resolve problems caused by a shading member being disposed above the sensors. Therefore, Osawa fails to disclose a central photodetector that is desensitized upon output thereof in comparison with those of the first photodetector and the second photodetector, as recited in claim 1. Withdrawal of the rejection of claim 1 is respectfully requested.

Claims 2 and 6-7 are allowable by virtue of their dependence on claim 1 and for their recitation of additional patentable subject matter. For example, Osawa fails to disclose that the third signal from the central photodetector is desensitized with respect to the first and second signals to produce first and second desensitized signals in the signal processing circuit, and the first and second desensitized signals are added to the first signal and the second signal, respectively, as recited in claim 2. As shown in column 6, expressions 5 and 6, Osawa discloses that the output from the first and second sensors are used as subtractions.

Finally, independent claim 8 was also rejected under Osawa. Because Osawa does not disclose first, second and central photodetectors arranged in an identical plane and a shading

member, Applicant respectfully requests that the rejection to claim 8 be withdrawn for at least the reasons noted above with respect to claim 1.

Withdrawal of the rejection by Osawa is respectfully requested.

Claims 12-15 are rejected under 35 U.S.C. §102(b) by Dierschke, et al., U.S. Patent No. 5,567,976. This rejection is respectfully traversed.

Claim 12 is directed to a sensor for detecting a quantity of light, including: a housing having a center axis along a direction in which light enters the sensor when the azimuth is zero with respect to the housing, the center axis dividing a surface of the housing into a first region and a second region; a first photodetector for detecting a first quantity of light entering the sensor from a side of the first region, the first photodetector having a first main portion entirely disposed on the second region and a plurality of first protrusions protruding from the first main portion toward the first region across the center axis; and a second photodetector for detecting a second quantity of light entering the sensor from a side of the second region, the second photodetector having a second main portion entirely disposed on the first region and having a plurality of second protrusions protruding from the second main portion toward the second region across the center axis; and a shading member disposed above the first and second photodetectors and having a light transmittance part and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the first and second photodetectors where the light is incident through the light transmittance and a non-incident area in the first and second photodetectors where the light is not incident; wherein the first main portion has a first predetermined width to be entirely disposed at the second region, and the first main portion is a first common portion to which the plurality of first protrusions are connected; the plurality of first protrusions has a first width to extend from the second region to the first region; the second main portion has a second predetermined width to be entirely disposed at the first region, and the second main portion is a second common portion to which the plurality of second protrusions are connected; and the plurality of second protrusions has a second width to extend from the first region to the second region.

Dierschke does not disclose a sensor for detecting a quantity of light as recited in claim 12. To begin with, Dierschke does not disclose a shading member disposed above the first and second photodetectors and having a light transmittance part and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the first and second photodetectors where the light is incident through the light transmittance and

a non-incident area in the first and second photodetectors where the light is not incident, as recited in claim 12.

Moreover, Dierschke does not disclose a first main portion that has a first predetermined width to be entirely disposed at the second region and the first main portion as a first common portion to which the plurality of first protrusions are connected, as recited in claim 12. Dierschke also fails to disclose a second main portion that has a second predetermined width to be entirely disposed at the first region and the second main portion as a second common portion to which the plurality of second protrusions are connected, as recited in claim 12. In Dierschke, the first protrusions are just connected at foot positions thereof. Likewise, the second protrusions are just connected at foot positions thereof. The sensor in Dierschke is configured to detect a ratio between a left side and a right side that receives light so as to determine the position of the light, even if the light spot becomes small. Thus, Dierschke does not disclose or consider first and second main portions having first and second predetermined widths to be entirely disposed at second and first regions, respectively, to become a common portion for the protrusions. Withdrawal of the rejection of claim 12 is respectfully requested.

Claims 13-15 are allowable by virtue of their dependence on claim 12 and for their recitation of additional patentable features.

Claims 3-5, 10 and 11 are rejected under 35 U.S.C. §103(a) over Osawa. This rejection is respectfully traversed.

The Office Action relies on Osawa to reject independent claims 1 and 8. Claims 3-5 depend from claim 1, and claims 10 and 11 depend from claim 8. These claims are allowable by virtue of their dependence on claims 1 and 8, and for their recitation of additional patentable features. Withdrawal of this rejection is respectfully requested.

New claims 16-19 have been added. Claim 16 depends from claim 1, claims 17 and 18 depend from claim 8, and claim 19 depends from claim 12. These new claims are allowable by virtue of their dependence on claims 1, 8 and 12, and also for their recitation of additional patentable features.

All objections and rejections have been addressed. It is respectfully submitted that the present application is now in condition for allowance.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned **"Version with markings to show changes made"**.

Further, we filed a PTO-1449 on November 17, 1999 along with the present application. Please proceed to consider the references cited therein and return an initialed copy of the November 17, 1999 PTO-1449 at your earliest convenience.

Should there be any questions or concerns regarding this application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

The title is changed as follows:

SENSOR FOR DETECTING A QUANTITY OF LIGHT INCIDENT ON A VECHILE

IN THE SPECIFICATION:

The paragraph that begins on page 1, line 23 and continues to page 2, line 12 is changed as follows:

As the sensor capable of detecting the quantity and direction of solar radiation, a 2D (two elements) type sensor has been developed. Referring to FIG. 22, the 2D type sensor has a left side detecting element (photodetector) 51 disposed at a right side of an axis L_{cent}, which is a reference of 0° in aximuth, and a right side detecting element (photodetector) 52 disposed at a [light] left side of the axis L_{cent}. A shading member 54 having a through hole 53 is disposed above the detecting elements 51, 52. The right side detecting element 51 and the left side detecting element 52 receive light from the right side and the left side of the axis L_{cent}, respectively, and output signals corresponding to quantities of light. When azimuth ∅ is 0°, 30°, 60°, or 90° as shown in FIGS. [4A to 4D] 24A to 24D, output ratios are as shown in FIG. 23. When azimuth ∅ is 0°, right side and left side output ratios CR_R, CR_L are 0.50, respectively. The left side and right side output ratios CR_L, CR_R are represented by the following formulas:

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A sensor for detecting a quantity of light, comprising:

a housing having a [an] center axis along a direction in which light enters the sensor when an azimuth is zero with respect to said housing, the center axis dividing a surface of the housing into a first region and a second region;

a light sensing portion disposed in said housing to sense incident light, including:

a first photodetector disposed on the second region of the housing;

a second photodetector disposed on the first region of the housing;

a central photodetector disposed on both the first region and the second region of the housing across the axis, and desensitized upon output thereof in comparison with [having a sensitivity lower than] those of the first photodetector and the second photodetector, wherein the first, second and central photodetectors are arranged in an identical plane; and

a shading member disposed above the sensing portion [housing] and having a light transmittance part [for transmitting light toward at least one of the central photodetector, the first photodetector, and the second photodetector] and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the sensing portion where the light is incident through the light transmittance and a non-incident area in the sensing portion where the light is not incident, wherein;

the first photodetector and the central photodetector cooperatively detect a first quantity of light entering the sensor from a side of the first region with respect to the axis; and

the [first] second photodetector and the central photodetector cooperatively detect a second quantity of light entering the sensor from a side of the second region with respect to the axis.

2. (Amended) The sensor of claim 1, further comprising a signal processing circuit for processing first, second, and third signals respectively outputted from the first photodetector, the second photodetector, and the central photodetector, wherein:

the third signal from the central photodetector is desensitized with respect to the first and second signals to produce first and second desensitized signals in said signal processing circuit, and the first and second desensitized signals are added to the first signal and the second signal, respectively [a gain of the third signal from the central photodetector is smaller than those of the first signal and the second signal so that the sensitivity of the central photodetector is lower than those of the first photodetector and the second photodetector].

8. (Amended) A sensor for detecting a quantity of light incident on a vehicle, comprising:

a housing having an axis along a front and rear direction of the vehicle in which light enters the sensor when an azimuth is zero with respect to said housing, the axis dividing a surface of the housing into a first region and a second region;

a first photodetector disposed on the second region of the housing, for outputting a first signal corresponding to a quantity of light incident thereon;

a second photodetector disposed on the first region of the housing, for outputting a second signal corresponding to a quantity of light incident thereon;

a central photodetector disposed on both the first region and the second region of the housing across the axis, and desensitized upon output thereof in comparison with [having a sensitivity lower than] those of the first photodetector and the second photodetector, for outputting a third signal corresponding to a quantity of light incident thereon, wherein the first, second and central photodetectors are arranged in an identical plane;

a shading member disposed above the first and second photodetectors [housing] and having a light transmittance part [for transmitting light toward at least one of the central photodetector, the first photodetector, and the second photodetector] and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the first, second and central photodetectors where the light is incident through the light transmittance and a non-incident area in the first, second and central photodetectors where the light is not incident; and

a signal processing circuit provided on the housing for determining a first quantity of light entering the sensor from a side of the first region based on the first signal and the third signal, and for determining a second quantity of light entering the sensor from a side of the second region based on the second signal and the third signal.

11. (Amended) The sensor of claim 9, wherein the light transmittance part of the shading member is disposed above a portion of the housing, the portion [which] is located at a rear side of the vehicle with respect to the signal processing circuit.

12. (Amended) A sensor for detecting a quantity of light, comprising:

a housing having [an] a center axis along a direction in which light enters the sensor when the azimuth is zero with respect to said housing, the center axis dividing a surface of the housing into a first region and a second region;

a first photodetector for detecting a first quantity of light entering the sensor from a side of the first region, the first photodetector having a first main portion entirely disposed on the second region and a plurality of first protrusions protruding from the first main portion toward the first region across the center axis; and

a second photodetector for detecting a second quantity of light entering the sensor from a side of the second region, the second photodetector having a second main portion entirely disposed on the first region and having a plurality of second protrusions protruding from the second main portion toward the second region across the center axis[,]; and

a shading member disposed above the first and second photodetectors and having a light transmittance part and a shading part, so as to introduce light through the light transmittance part and determine an incident area in the first and second photodetectors where the light is incident through the light transmittance and a non-incident area in the first and second photodetectors where the light is not incident;

wherein:

the first main portion has a first predetermined width to be entirely disposed at the second region, and the first main portion is a first common portion to which said plurality of first protrusions are connected;

the plurality of first protrusions has [extend on the first region with] a first width to extend from the second region to the first region [from the axis together with the plurality of second protrusions]; [and]

the second main portion has a second predetermined width to be entirely disposed at the first region, and the second main portion is a second common portion to which said plurality of second protrusions are connected; and

the plurality of second protrusions has [extend on the second region with] a second width to extend from the first region to the second region [from the axis together with the plurality of first protrusions].

14. (Amended) The sensor of claim 12, wherein the plurality of first protrusions and the plurality of second protrusions are alternately disposed [one another] along the center axis.

New claims 16-19 have been added.